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PROVISIONAL INTELLIGENCE REPORT

PETROLEUM IN THE SOVIET BLOC

THE IMPORTATION, DISTRIBUTION, AND CONSUMPTION OF PETROLEUM PRODUCTS IN CHINA AND MANCHURIA

CIA/RR PR-17 (III-B)

26 February 1953

Note

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CONTENTS

		Page
Summary and Conclusions		1
I.	Imports of Petroleum Products	2
	A. By Year and by Type of Product	3
	B. Sources	4
	C. Quantities, Types, and Ports of Entry	5
II.	Storage of Petroleum Products by Area and by Type of Product	8
	A. Prewar Pattern	9
	B. Postwar Pattern	9
III.	Distribution of Petroleum Products	11
	A. Prewar Pattern	11
	B. Postwar Pattern	13
IV.	Consumption of Petroleum Products	13
	A. Manchuria	14
	1. Prior to 1932	14
	2. Japanese Occupation	14
	3. Postwar	16
	B. China	17
	1. Prior to 1937	17
	a. Transportation	17
	(1) Railroads	17
	(2) Motor Vehicles	18
	(3) Shipping	18
	b. Industry	19
	c. Domestic Heating, Cooking, and Lighting	19
	2. Wartime	21
	a. Japanese Occupation	21
	b. Nationalist China	22
	c. Total	22

Page

3. Postwar (Including Manchuria) 24

a. Transportation 25

(1) Railroads 25
(2) Motor Vehicles 26
(3) Military and Civil Aviation 29
(4) Shipping 30

b. Industry 32
c. Domestic Heating, Cooking, and Lighting . . . 34

C. Chinese Communist POL Requirements 35

Appendixes

[redacted] 25X1

Appendix B. Methodology 38

Illustrations

Following Page

Chinese POL Imports, 1925-50 (Chart) 3

Prewar Distribution of Petroleum Products in China Proper (Map) 38

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THE IMPORTATION, DISTRIBUTION, AND CONSUMPTION OF PETROLEUM PRODUCTS IN CHINA AND MANCHURIA*

Summary and Conclusions

Although Nationalist China imported approximately 2 million tons of petroleum, oil, and lubricating oil (POL) in 1947, an historical analysis of basic petroleum requirements of the Chinese economy reveals that much less than this quantity probably will satisfy the demands of the Chinese Communist military and civilian consumers. China's demand for petroleum appears to be almost totally elastic, and the few inelastic requirements for petroleum products do not seem to bulk large in quantity. In fact, the problem of petroleum consumption in China seems primarily to have hinged on the availability of supplies of petroleum products.

In the period before Japanese occupation of North China in 1937, China and Manchuria imported POL at the annual rate of approximately 900,000 metric tons. The bulk of this total was made up of kerosene and fuel oil. The demand for diesel oil, motor gasoline, and lubricating oil was very low. During World War II, the Japanese-occupied areas of China, Manchuria included, consumed an undetermined quantity of POL which is estimated to have been no less than 80,000 metric tons and no more than 326,000 metric tons per year. The areas left to unoccupied China consumed POL at an approximate annual rate of 56,000 metric tons. Thus, wartime requirements for all China, including the areas occupied by the Japanese, are estimated to have ranged between 136,000 and 400,000 metric tons per year. Much of this POL went to the military effort. Basic civilian requirements for POL in the Japanese-occupied areas of China and Manchuria are presently unknown, and the civilian consumption of POL in unoccupied China was considerably less than 20 percent of the total POL and petroleum substitutes available.

After the war, primarily because coal was not available, unusually large quantities of fuel oil were imported into China. Factors which contributed to the importation and consumption of more petroleum products than had occurred in any previous period included the reconstruction efforts of UNRRA, the continuing struggle against the Chinese Communists, the internal attempt by the Chinese Nationalists to rehabilitate the Chinese economy, and the policies of the foreign oil companies who brought

* This report contains information available to CIA as of 1 July 1952.

in more POL than was estimated to be required by all observers. Toward 1949, however, imports of POL were declining, evidently seeking more "normal" levels. Some technological progress and mechanization did occur during the preceding quarter of a century, although it is easy to exaggerate its extent.

During the recent 3 years of Chinese Communist rule in China, consumption of petroleum products has been determined by two major factors: availability and military requirements occasioned by the Chinese Communist entry into the Korean war. The elastic civilian requirement for POL in Communist China apparently has remained relatively unchanged and may be assumed to have been small enough to have been met from the decreased supplies available in 1950, when petroleum products from Western sources were choked off. According to the latest estimates based on a qualitative rather than a quantitative analysis, the Chinese Communists have used between 300,000 and 850,000 metric tons of POL annually, depending on the availability of supplies. The latter figure is believed to represent present requirements for civilian and military needs. Approximately 60 percent of this is believed to be going directly to support military efforts in Korea.

Approximately 700,000 metric tons of storage capacity are estimated to have become available to the Chinese Communists by their conquest of the mainland in 1949, although only 596,000 metric tons of that capacity were in use in 1949. This total storage capacity represents a decrease when compared to the approximately 1 million tons of capacity that existed before World War II.

The Communist victory in 1949 meant a disruption of the historic POL distribution pattern. Formerly, supplies were brought in by sea to the ocean terminals, primarily the large port cities, and the products were then distributed by ship and rail to inland consumption points. At the present time, the major portion of China's POL supplies are moving into Manchuria by rail over the Trans-Siberian Railroad. Although the volume of this traffic can only be approximated, it is believed to place a heavy burden on the capacities of the Trans-Siberian rail system.

I. Imports of Petroleum Products.

Technological backwardness, more than any other single factor, accounts for the fact that China has imported the major part of its petroleum products in the past. Although relatively good domestic petroleum reserves exist, they have not been developed extensively, and, as late as 1952, China remains dependent upon foreign sources for its petroleum supply.

The import of petroleum, oil, and lubricating oil (POL) into China has been affected by the changing military and political scene. Instead of steady trends in Chinese imports, storage, and distribution patterns, there have been chaotic fluctuations, the vagaries of which underline the conclusion that as a consumer of POL China is an enigma.

In 1932, following the loss of Manchuria to Japan, Chinese POL imports began to decline. After 1937, when Japan moved into North China, these imports continued downward. Following the entry of the US into World War II and the resulting drying up of all petroleum supplies, Chinese imports fell practically to zero. When petroleum supplies became available again in 1946, however, China imported and consumed quantities of POL far in excess of any need that analysis might have projected from prewar data on imports and consumption.

There has been no period of time, therefore, during the last 35 years that can be described as "normal" as far as Chinese importation of petroleum products is concerned.

A. By Year and by Type of Product.

Imports of petroleum products by year and by type of product are consolidated in the following chart.* 1/** As can be seen from the product breakdown presented in this chart, the major petroleum product imported by China in 1925 was kerosene, presumably used for lighting and cooking. In the following 25 years, this situation changed slowly until fuel oil, which includes diesel oils, exceeded kerosene in volume. This qualitative shift in the type of product consumed cannot, however, be taken too literally as representative of an over-all shift to fuel oil as a fuel for the Chinese economy. For years, for instance, the Chinese have cracked fuel and diesel oils into kerosene and residuals in primitive stills in Shanghai and in other oil-consuming centers. In one postwar year alone, one observer estimated that they cracked approximately 132,000 metric tons of fuel and diesel oils in this manner. 2/

Over the years, the imports of lubricating oil and motor gasoline remained more constant than did the imports of other types of petroleum products. This fact is a strong indication that little progress in motor transport has been made in the last three decades. As a consumer of petroleum products, in fact, China is still one of the most primitive of all nations.

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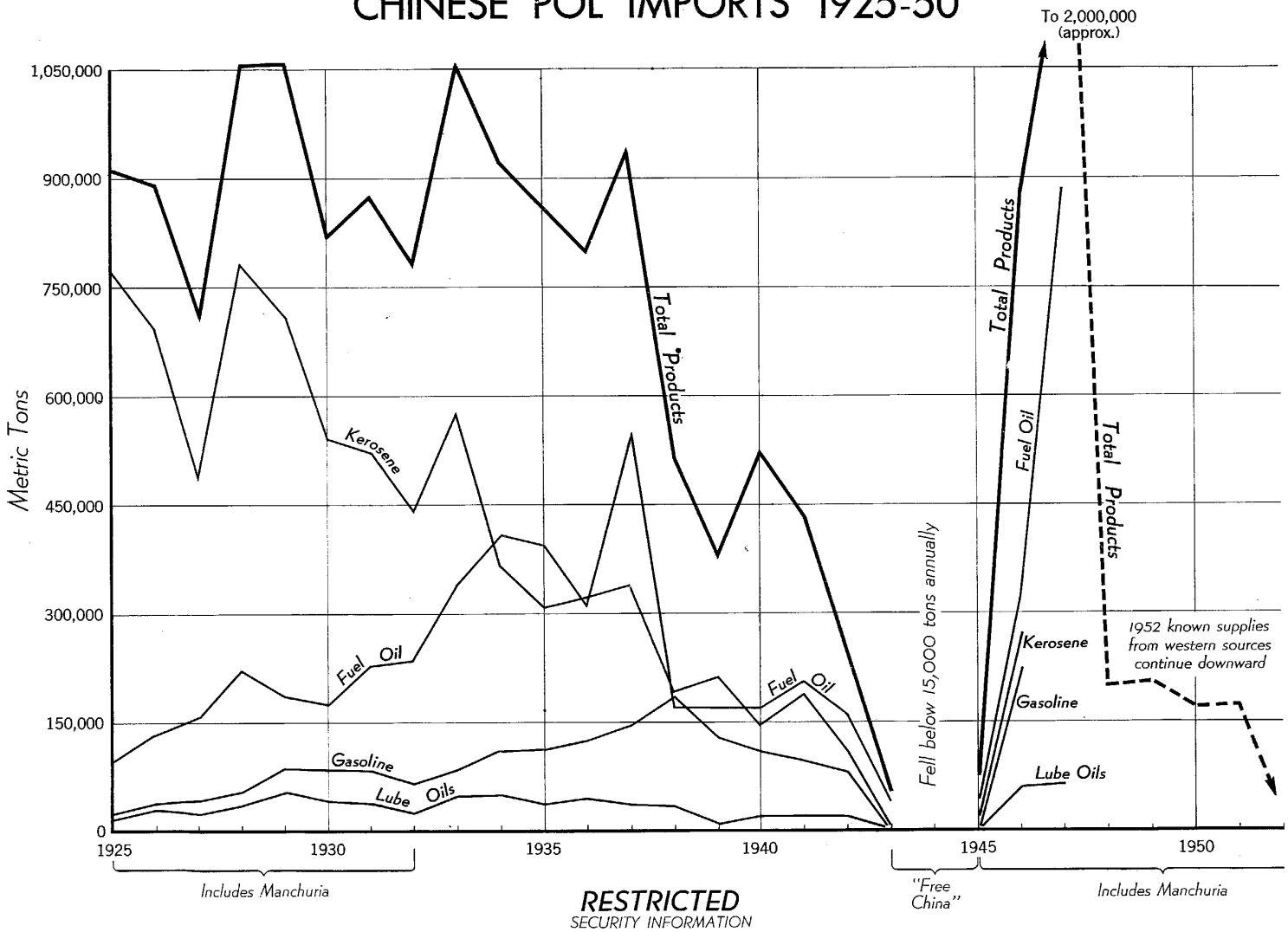
CHINESE POL IMPORTS 1925-50



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Since Manchuria was a part of Japan from 1932 to 1945, the statistics on Manchurian imports must be dealt with separately. Imports into Manchuria, before 1932, reached 100,000 metric tons per year. In the 3-year period preceding Japan's envelopment of North China, Manchurian POL imports ranged from 60,000 to 158,000 metric tons per year. In 1940, Japan imported 234,774 metric tons of petroleum products and crude oil into Manchuria. 3/

Thus, before 1946, imports of petroleum products into China and Manchuria rarely exceeded 1 million metric tons per year, and, for a great number of those years, they fell below this mark.

B. Sources.

Before 1941, petroleum products came principally from UK, US, and Japanese sources. In 1934, Japan took over from foreign competitors the distribution of oil products in Manchuria and, as 1937 approached, began to threaten the operations of the UK and US companies in China. Before 1937, however, Japan succeeded in capturing only about 10 percent of the Chinese POL market.

Once the Japanese were established in the major port cities of China after 1937, the sales of US and UK companies fell off greatly, and the Nationalist Chinese were forced to subsist upon uncertain supplies from the US and its allies and upon substitute fuels developed within the economy.

Following the defeat of the Japanese in the Pacific in 1945, the restitution of Manchuria to China, and Japan's displacement as an oil supplier, POL supplies flooded into China once again from prewar sources. From 1946 to 1949, Standard Vacuum (StanVac), California-Texas (CalTex), the Asiatic Petroleum Company, and the Chinese Petroleum Corporation imported and distributed to Chinese consumers almost all the petroleum products sold in China. The Chinese Petroleum Corporation was set up by the Chinese Nationalists to share in the marketing business which, in prewar years, had been a virtual monopoly of the three foreign companies.

The defeat and removal of the Chinese Nationalists to Formosa in 1949, and the ensuing embargoes imposed by Western nations upon the shipment of strategic materials to the Chinese Communists in 1950, forced the Communists to rely on imports from the USSR, to maximize the use of substitute fuels, and to expedite the development of their indigenous production in order to obtain supplies of liquid fuels for their economy.

C. Quantities, Types, and Ports of Entry.

Fortunately, a precise breakdown by quantities, types, and ports of entry of Chinese imports of POL in the prewar and postwar periods is available. This information is summarized in Table 1* and Table 2.** In Table 1, North China is defined to include the following ports: Tientsin, Tsingtao, Chefoo, Ch'in-huang-tao, Lung-k'ou, and Wei-hai-wei. Central China includes Shanghai, Chen-Chiang, Nanking, Wu-Hu, Chiu-chiang, Hankow, Yo-chou, Ch'ang-sha, Sha-shih, I-ch'ang, Wan-hsien, Chungking, Soochow, Hangchow, Ning-po, and Wenchow. Central China includes the Yangtze river ports. South China includes San-tu-ao, Foochow, Amoy, Swatow, Canton, Kowloon, Kung-pei, Chiang-men-chiang, San-shui, Wuchow, Nan-ning, Lei-chou, Pei-hai, Lung-ching, Mang-tzu, Ssu-mao, and T'eng-yueh. 4/

The postwar port-of-entry pattern shifted considerably, a fact that can best be ascribed to the uneven rate at which various Chinese ports were restored to service. In Table 2, North China includes the ports of Ch'in-huang-tao, Tientsin, and Tsingtao. Central China includes Hankow and Shanghai, and South China includes Amoy, Swatow, Canton, Kowloon, Kongmoon, Soochow, Nan-ning, and Lei-chou. 5/

Central China in 1936 and 1937 was the greatest importer of petroleum products, when it brought in about 60 percent of the total, and Shanghai and Hankow accounted for 80 percent of the POL imported into China in 1946. These facts suggest that Central China has always been the major POL-consuming area of China.

Although imports did not exceed 1 million metric tons up to and including 1946, imports zoomed above 2 million metric tons in 1947. In 1948, however, imports began to fall off, and they continued downward in 1949. Table 3*** summarizes POL import details for the 1947-49 period. 6/

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* Table 1 follows on p. 6.
** Table 2 follows on p. 7.
*** Table 3 follows on p. 8.

Table 1

Imports of POL into China by Area
1936-39

Metric Tons

Product	North China	Central China	South China	Annual Grand Total
1936				
Gasoline	14,000	100,065	32,503	146,568
Fuel and Diesel Oil	15,528	170,766	158,085	344,379
Kerosene	91,962	212,983	35,368	340,313
Lubricating Oil	3,421	31,153	999	35,573
Total	124,911	514,967	226,955	866,833
Percent of Annual Grand Total	(14.4)	(59.4)	(26.2)	(100)
1937				
Gasoline	22,874	94,157	56,912	173,943
Fuel and Diesel Oil	12,748	284,367 a/*	234,163	531,278
Kerosene	66,962	77,522	47,296	191,780
Lubricating Oil	3,186	28,815	1,425	33,426
Total	105,770	484,861	339,796	930,427
Percent of Annual Grand Total	(11.4)	(52.1)	(36.5)	(100.0)
1938				
Gasoline	10,260	22,081	95,706	128,047
Fuel and Diesel Oil	7,972	71,159	90,984	170,115
Kerosene	68,424	60,056	81,615	210,095
Lubricating Oil	4,437	6,703	1,541	12,681
Total	91,093	159,999	269,846	520,938
Percent of Annual Grand Total	(17.5)	(31.0)	(51.5)	(100.0)

* Footnote to Table 1 follows on p. 7.

Table 1

Imports of POL into China by Areas
1936-39
(Continued)

Metric Tons

Product	North China	Central China	South China	Annual Grand Total
1939				
Gasoline	19,198	28,343	60,276	107,817
Fuel and Diesel Oil	13,570	66,848	53,608	134,026
Kerosene	79,368	36,207	34,058	149,633
Lubricating Oil	9,228	9,267	607	19,102
Total	121,364	140,665	148,594	410,623
Percent of Annual Grand Total	(30.0)	(34.0)	(36.0)	(100.0)

a. This figure was given in the original source as 584,367 metric tons. This is believed to be in error by 300,000 metric tons. The China Handbook 1937-1943 lists diesel oil imports for 1937 at 258,997 metric tons. The same figure was furnished to the State Department by Chinese officials in a memorandum written in 1948.

Table 2

Imports of POL into China by Areas
1946

Metric Tons

Product	North China	Central China	South China	Total
Gasoline	38,803	193,362	34,194	266,359
Fuel and Diesel Oil	2,776	317,256	11,690	331,712
Kerosene	42,207	148,607	33,464	224,278
Lubricating Oil a/	8,956	47,081	3,237	59,280
Paraffin Wax	3	4,498	680	5,181
Total	92,745	710,804	83,271	886,810
Percent of Total	(10.5)	(80.0)	(9.5)	(100.0)

a. Includes greases.

Table 3

Imports of POL into China
1947-49

Metric Tons

Product	1947	1948	1949 a/
Gasoline	407,984	250,706	126,000
Fuel and Diesel Oil	1,207,140	996,540	497,000
Kerosene	285,581	106,800	56,000
Lubricating Oil b/	57,746	44,308	21,000
Paraffin Wax	5,712	N.A.	N.A.
Asphalt	17,350	N.A.	N.A.
UNRRA Imports of All Products	41,345	0	0
Total	2,023,858	1,398,354	700,000

a. These totals include greases only for the year 1947.
b. This column of figures was derived by accepting total imports for 1949 as being equal in value to approximately one-half that of 1948 and by distributing the total among the products by the percentage distribution that obtained in 1948.

At the present time the USSR is supplying China with almost all its required petroleum. Consequently, no firm data exist on which to base estimates of current imports.

II. Storage of Petroleum Products by Area and by Type of Product.

There are, in general, three possible types of storage for oil: (1) bulk storage facilities for crude oil, usually located near production sources and refining installations; (2) bulk storage facilities for refined products, often found near refineries, transloading, and consuming points; and (3) warehouse storage areas for packaged goods. Of these three types, however, only the second and third are important in the Chinese oil economy. According to the latest available information, the facilities for storing crude oil in the few Chinese oil fields are of the poorest sort. Collecting systems for field crude oils are also primitive. The storage of products in the Yumen oil field refinery area in Kansu Province was a pressing and unsolved problem as late as December 1942, when the amount to be stored totaled less than 13,000 metric tons. 7/

Storage facilities for imported products, however, were adequate in the past. They were built by the foreign oil companies. Once the ocean-going tankers unloaded their cargoes in the bulk terminal storage depots located in the Chinese port cities, one of two things generally happened to the petroleum products. They were either moved to other inland storage facilities by railroad tank cars, oil barges, and junks, or were packaged in cans and barrels to be moved to consumption points by more various means of transportation, including the human back.

A. Prewar Pattern.

Because of their domination over the distribution of petroleum products in China, the foreign oil companies have maintained the most accurate historical information on the storage facilities in China. During World War II, these oil companies furnished the Foreign Operations Committee of the Petroleum Administration for War with a detailed listing of bulk storage facilities by location and by type of product. 8/ These data were brought up to date in March 1949 by further company releases on postwar storage to IAC agencies. 9/ Information on the storage of petroleum products in Communist China is extremely fragmentary, although it can best be estimated against the backdrop of the data furnished by the foreign oil companies.

The total prewar facilities for bulk product storage in China, Manchuria, the Kwangtung Peninsula (Dairen), and Hong Kong (134,919 metric tons) equaled 1,025,000 metric tons. 10/ The scattered warehouses used for barrel and drum storage in those same areas increased the total storage capacity by another 240,000 metric tons. 11/

Table 4* lists the prewar storage capacity of bulk tank and warehouse package oil storage facilities by province. 12/

B. Postwar Pattern.

A US Naval Attaché report from Shanghai dated 12 June 1947 gave the totals for usable POL tank storage on the Chinese mainland at approximately 580,000 metric tons. His source was a group of Chinese Nationalist officials, whose account reportedly took cognizance of losses of tanks during the war period. 13/

* Table 4 follows on p. 10.

Table 4

Prewar Storage Capacities for POL in China
by Province and by Type of Storage

Province	Bulk Product Tank Capacity (Metric Tons)	Warehouse Capacity a/* StanVac and CalTex (Metric Tons)	Warehouse Capacity a/* Asiatic Petroleum Co. (Square Feet)
Kwangtung	54,779	10,219	84,759
Kwangsi	2,449	1,735	18,280
Fukien	25,055	11,649	55,722
Kiangsu	289,916	32,498	176,117
Chekiang	5,415	2,281	30,338
Anhwei	13,518	4,702	34,063
Kiangsi	25,557	6,081	40,236
Hupeh	159,465	15,402	106,812
Hunan	47,031	4,438	49,262
Szechwan	29,675	3,685	28,746
Shantung	52,861	9,039	63,546
Hopeh	100,758	13,684	138,687
Chahar	360	291	3,098
Shensi	0	473	0
Shansi	224	241	12,300
Yunnan	0	725	0
Subtotal	807,063	117,143	841,966
Hong Kong	135,000	27,061	90,360
Kwantung Province (Dairen)	56,446	6,660	11,000
Manchuria	26,900	5,582	113,391
Grand Total	1,025,409	156,446	1,056,717 (85,714) b/

* Footnotes to Table 4 follows on p. 11.

Table 4

Prewar Storage Capacities for POL in China
by Province and by Type of Storage
(Continued)

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b. In order to reduce the square-foot capacity of these warehouses belonging to the Asiatic Petroleum Company to metric-ton capacity, 20 percent of the approximate 1 million square feet of space was allowed for corridors, offices, and other space wastage. The remaining 800,000 square feet was multiplied by 5, a figure representing assumed stacking height. This resulted in a figure for cubic footage. This was multiplied by 7.5, the number of gallons of liquid fuel that normally occupy a cubic foot of space. The resulting 30 million gallons was divided by 350, a conversion factor to reduce petroleum products to metric tons.

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Later information, 25X1 revealed that oil storage capacity on the Chinese mainland, including Hong Kong, was almost equal to its prewar total, although only about three-fourths of the reported 1-million-ton capacity was usable. 14/ Excluding Hong Kong, Manchuria, and Dairen, Chinese mainland total storage capacity equaled about 596,000 metric tons, according to these oil company records. Thus, information from two independent sources corroborate the fact that POL tankage capacity on the Chinese mainland in the postwar period was approximately 580,000 to 590,000 metric tons. Since no evidence of later major changes in the storage situation exists, it may be assumed that this range of figures represents the approximate storage capacity available to the Chinese Communist government.

The latest available data on the POL storage situation in China are given in Table 5.* 15/

III. Distribution of Petroleum Products.

A. Prewar Pattern.

The prewar pattern of POL distribution in China is graphically presented on the map.** The map is a condensation of more than 200 pages of text published by the Enemy Oil Committee during World War II. The information contained in that report is the firmest available, however, because it rests upon reports made to that committee by the foreign oil companies operating in China.

As the flow lines on the map indicate, Hong Kong, Shanghai, Tsingtao, Tientsin, and Dairen were the principal prewar continental ports

* Table 5 follows on p. 12.
** Following p. 38.

Table 5

Postwar Storage of POL in China by Product and by Area

Metric Tons

Area	Aviation Gasoline	Motor Gasoline	Kerosene	Diesel Oil	Fuel Oil	Unspecified	Area Total
North China							
Tsingtao	7,822	5,757	6,412	11,606	3,251	208	
Tientsin Area	7,652	17,749	28,570	9,380	0	48,379	
Subtotal	15,474	23,506	34,982	20,986	3,251	48,587	146,786
Percent of Area Total	(10.5)	(16.0)	(24.0)	(14.3)	(2.2)	(33.0)	(100.0)
Central China							
Shanghai	27,168	45,340	61,439	128,809	115,382	15,092	
Yangtze Ports	3,543	16,717	31,947	14,408	0	52,426	
Subtotal	30,711	62,057	93,386	143,217	115,382	67,518	512,271
Percent of Area Total	(6.0)	(12.0)	(18.0)	(28.0)	(23.0)	(13.0)	(100.0)
South China							
Canton	3,370	8,105	13,543	11,702	2,783	13,153	
Subtotal	3,370	8,105	13,543	11,702	2,783	13,153	52,656
Percent of Area Total	(6.4)	(15.4)	(25.7)	(22.3)	(5.2)	(25.0)	(100.0)
Grand Total	49,555	93,668	141,911	175,905	121,416	129,258	711,713 a/
Percent of Area Grand Total	(7.0)	(13.0)	(20.0)	(25.0)	(17.0)	(18.0)	(100.0)

a. From this total of 711,713 metric tons of storage capacity reported by the oil companies, the quantity of storage reported to be not in use should be subtracted. This amounted to 115,255 metric tons. Thus, the total available storage equaled about 596,000 metric tons on the Chinese mainland, exclusive of Hong Kong, Manchuria, and Dairen.

of entry for POL. From each of those major ports, the products were transshipped by water or by railroad tank car and boxcar to sub-installations and consuming centers. The majority of oil products moved inland by water, and the greatest quantity moved along the Yangtze River system.

As the map reveals, however, there were really four distinct POL distribution areas. Manchuria and Korea made up one area, being under the control of the Japanese. North, Central, and South China were isolated from one another. In other words, the sectionalism of culture, politics, and geography was reproduced in the networks of petroleum product distribution.

B. Postwar Pattern.

After the Communists took over China in 1949, the pattern of POL distribution in China changed completely. Following the outbreak of Korean hostilities and the entry of the Chinese Communists into that struggle, petroleum products were denied to the Chinese Communist economy by the Western bloc of nations. Although small quantities of POL reached China in 1950 and 1951 through Hong Kong and the Portuguese colony of Macao, the stream had dried to a trickle by early 1952

As China reduced her consumption and requirements and turned to the USSR for essential military and civil requirements, a shift from sea-borne shipments to railroad imports occurred. In mid-1951, oil was moving from Dairen to Tsingtao at the rate of approximately 500 metric tons per month on small harbor boats, reversing, thereby, the immediate postwar trend of supplying Dairen from Tsingtao. 16/ Although some oil moved to Chinese ports in Soviet Bloc tankers in this period, it is believed that the greatest quantities of petroleum moved over the Trans-Siberian Railroad into Manchuria, Korea, and China. The belief that in early 1952 supplies moved by rail into Dairen and, thence, into China is supported by numerous interrogations of Korean prisoners of war [redacted] 25X1

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IV. Consumption of Petroleum Products.

In order to determine the demand pattern for POL in China, it is necessary to work out the details of POL use in China before, during, and after World War II. It is hoped that such an approach will offer at least a partial solution to the problem of how much POL is required by the Chinese Communists for current operation of their economy under the conditions of peace and war.

A. Manchuria.

For purposes of simplification and because Manchuria was actually separate from China for the majority of the years with which this report is concerned, Manchuria is treated apart from China. Before 1932, although the Japanese in Manchuria were significantly numerous, Manchuria was an integral part of China. From 1932 until 1945, Manchurians were citizens of the Japanese Empire. From 1946 to 1949, Chinese Communists and Chinese Nationalists fought for control of that area with victory falling to the Communists. At the present time, Manchuria has become a forward staging area for the Chinese Communist military adventure in Korea.

1. Prior to 1932.

Before 1932, Manchuria had a coal-burning economy. At that time, little POL was needed or used by industry or railroads. Motor vehicles were not numerous. These statements are illustrated in Table 6* and Table 7.** 18/

Thus, Manchurian industry and railroads consumed approximately 4,200 metric tons per year. Of this total, railroads accounted for 88 percent of petroleum products consumed by these two categories.

Although there are no such precise data on the consumption of gasoline and lubricating oil by motor vehicles for this period, the total quantities of those products consumed in Manchuria may be assumed to have been negligible. The minimum requirements for gasoline, motor oil, and fuel and diesel oils in Manchuria may have been as low as 10,000 metric tons per year prior to 1932. However, kerosene for domestic lighting might have increased the range of POL requirements in Manchuria from 75,000 to 100,000 metric tons per year. 19/

2. Japanese Occupation.

From 1932 until 1945 the Japanese developed Manchuria as an integral part of their ambitious Far Eastern Empire and used it as an area from which to launch offensives into China. Evidence of the use of petroleum fuel during this period is so scarce that its very absence suggests how unimportant POL was in Manchuria in these years.

Table 8*** presents the product output of the Fushun Works, the only production recorded in Japanese primary sources. 20/

* Table 6 follows on p. 15.
** Table 7 follows on p. 15.
*** Table 8 follows on p. 16.

Table 6

Consumption of Fuel by Manchurian Industry
1933

Metric Tons

Industry	Coal	Coke	Gasoline	Light Oil	Kerosene	Heavy Oil
Textile	17,717	8	0	2.1	9.3	0
Metal Goods	5,068	5,511	1.8	0.7	0	.4
Machinery, Rolling Stock, and Shipbuilding	40,668	11,929	22	6	2	396
Cement, Brick, and Tile Manufacturing	202,352	17,090	0.7	0	3.8	6
Chemical	114,884	25,015	0	0	17	0
Food Processing	31,065	483	0	0.9	6	0
Power Plants	5,578	0	0	0	0	0
Natural Gas Manufacturing	4,954	7,037	0	0	0	0
Saw Mills and Woodworking	376	6	0	0	0.3	0
Printing and Bookmaking	2,812	30	0.9	0	0.9	0
Miscellaneous	4,013	39	0.7	0	0.5	0.3
Total	429,487	67,148	26.1	9.7	39.8	402.7

Table 7

Consumption of POL by Manchurian Railroads
1940-41

Metric Tons

Type of POL	1940	1941
Steam Cylinder Oil	1,013	1,037
Axle Oil	1,817	1,773
Lubricating Oil	93	79
Grease	844	813
Total	3,767	3,702

Table 8

Shale Oil Production of the Fushun Works
1941-44

Metric Tons

Year	Aviation Gasoline	Motor Gasoline	Gasoil	Diesel	Fuel	Total
1941	155	10,022	3,898	28,518	83,639	126,232
1942	132	9,699	5,064	124,162	0	139,057
1943	51	4,189	9,577	37,142	0	50,959
1944	0	2,857	3,698	64,553	0	71,108

If the totals listed above are taken as equivalent to consumption in Manchuria in the period of Japanese occupation, it will be noticed that consumption fell off considerably. Basic requirements in the period immediately preceding the Japanese occupation, however, seem to have been quite low, so that the decrease from 126,000 metric tons to 71,000 metric tons is plausible. It should also be pointed out that between 1941 and 1944 an undetermined amount of the oil produced in Manchuria was moved into China to be used by the Japanese forces engaged in subduing China. Although the average drop in POL production and consumption was 46 percent in this period, coal consumption in Manchuria increased 20 percent. 21/ This correlative increase in coal consumption, accompanying the POL production decline, suggests that widespread substitutions of fuels within the economy occurred.

3. Postwar.

At the present time, knowledge of postwar developments in Manchuria is extremely sketchy. All that can be done for the postwar period in Manchuria is to establish a reasonable range of requirements which do not contradict what is known about POL requirements in Manchuria before 1946. One result of the postwar stripping of the Japanese oil installations in Manchuria by the USSR may have been to cut back the supplies available to the economy to as little as 40,000 metric tons in the immediate postwar period. By 1949, however, requirements may have reached the prewar average of 100,000 metric tons. In 1952, military requirements alone may have reached 500,000 to 600,000 metric tons. 22/ Thus, the average yearly requirement for POL in Manchuria prior to the Korean war may have fallen between 40,000 and 100,000 metric tons per year.

B. China.

1. Prior to 1937.

Like Manchuria, the Chinese economy was coal burning in the prewar years. Kerosene for domestic lighting, cooking, and heating bulked largest as the petroleum product most in demand in prewar China. The demand for lubricating oil and gasoline was small, reflecting the small number of motor vehicles and the backwardness of Chinese industrialization.

It should also be emphasized at this point that not all the oil products imported by the foreign oil companies were consumed by the Chinese. In fact, a significant percentage of imported POL was consumed in this period by foreigners living in the foreign settlements and missions. They owned a large number of China's automobiles, and their demands for POL for heating and lighting were great. In 1935, for instance, approximately 100,000 foreigners resided in China. Shanghai alone contained 39,000. If the 1937 per capita POL consumption for US residents of about 1 metric ton per person is applied to foreign residents of China, in the absence of any better data, then approximately 100,000 metric tons may have been consumed by foreigners in 1937. 23/ This estimate means that POL consumption by the Chinese nationals alone would have been considerably lower than import figures indicate. Since no better statistical support for consumption by foreigners exists, this distinction is not made in this report for the period prior to 1937. Consumption by other categories in China is detailed in the following sections.

a. Transportation.

(1) Railroads.

A study of Chinese railroads made by the Japanese prior to their invasion of China reveals how much POL was used by those railroads in the pre-1937 period. According to the Japanese study, a total of only 9,500 metric tons was needed for the annual operation of the Chinese railroads between 1931 and 1934. The breakdown by type of product used and rate of consumption per locomotive mile is given in Table 9.* 24/

The average size of the Chinese locomotive park between 1931 and 1934 was 1,195 locomotives. The distance traveled per locomotive per year averaged 26,533 miles. Thus, the total average number

* Table 9 follows on p. 18.

Table 9

Consumption of POL by Chinese Railroads
1931-34

Year	Cylinder Oil (Kilograms per Mile)	Machine Oil (Kilograms per Mile)	Axle Grease (Kilograms per Axle)
1931	0.0822	0.226	5.08
1932	0.0768	0.198	4.28
1933	0.0858	0.217	6.91
1934	0.0798	0.201	6.80
Average	0.0812	0.2105	5.77

of miles traveled by all locomotives in an average year during this period was 31,706,935 miles. 25/ Applying this average figure to the consumption factors listed in Table 9, the quantity of POL consumed by Chinese railroads in metric tons was as follows: cylinder oil, 2,537; machine oil, 6,658; grease, 429*; making a total of 9,624.

(2) Motor Vehicles.

Motor vehicles were, for the most part, limited to Shanghai and other large cities in prewar China. It has been estimated that in 1936 there were only 37,700 motor vehicles of all types in China. 26/ Imports of gasoline for that year totaled 146,568 metric tons. 27/ Allowing a 5-percent loss between ocean terminal and vehicular consumption, approximately 140,000 metric tons of motor gasoline were available to consumption by motor vehicles in China in this period. Taking into account such miscellaneous uses of motor gasoline as running stationary motors, motor gasoline consumption may have ranged from 100,000 to 150,000 metric tons, or from 3 to 4 metric tons per vehicle per year.

(3) Shipping.

Most of the Chinese inland water and coastal shipping was in foreign hands before 1937, and, in addition, most of it

* The figure for grease consumption was reached by multiplying the number of locomotives, passenger cars, and freight cars by the number of axles (4) and by 5.77 kilograms, the average factor for grease consumption per axle per year.

was coal burning. 28/ Some lubricating oil was needed, but the amount can be considered to have been negligible. The lubricating oil requirement for this period should not have exceeded 5,000 metric tons, although it should be emphasized that this figure is only a guess.

The various means of transportation in China, therefore, accounted for between 115,000 and 155,000 metric tons of POL at standards of operation that fell well below Western standards.

b. Industry.

It might be expected that industry would be the other major consuming sector of the Chinese economy in the period under study. Industry, however, including thermal electric power stations, consumed at an annual rate of less than 20,000 metric tons of petroleum products before 1937. All Chinese industry, in fact, consumed petroleum products at the approximate rate of only 63 metric tons per day. Three hundred working days per year for all industries are assumed in Table 10.* The data on which the table is based are taken from captured Japanese statistics on Chinese industrial fuel requirements. 29/

c. Domestic Heating, Cooking, and Lighting.

Transportation and industry required less than 200,000 metric tons of POL in the period before 1937. The balance of POL not used by those sectors of the economy may, therefore, arbitrarily be assigned to the category of domestic heating, cooking, and lighting. This category of POL consumption is the most difficult to pin down and, at the same time, is the area of consumption in which the greatest cutbacks can be made in time of emergency or in the event of a decrease in supplies. To quantify these variations historically is difficult; that the variations existed and that there were extreme fluctuations is borne out by testimony from many different sources.

One method by which to estimate the amount of POL available to consumption by the domestic sector of the Chinese economy is to work from the imports for 1936. These imports totaled 866,833 metric tons. Subtracting 5 percent for losses, 823,492 metric tons of POL were available to consumption. Subtracting from that total the range of requirements by transportation and industry of 135,000 to 175,000 metric tons, the quantity available to domestic heating, cooking, and lighting ranged between 648,492 and 688,492 metric tons. One rough cross-check on these

* Table 10 follows on p. 20.

Table 10

Consumption of Fuel Oil by Chinese Industries a/
1935

Industry	Metric Tons	Percent
Saw Mills and Cabinet Manufacturing	31	0.17
Furniture Manufacturing	4	0.02
Metallurgical	48	0.26
Machinery and Metal Goods Manufacturing	580	3.15
Transportation Equipment Manufacturing	361	1.96
Tile, Cement, Pottery, and Related Product Manufacturing	933	5.06
Textile	7,105	37.72
Power Plants	1,659	9.01
Chemical	853	2.32
Garment Manufacturing	63	0.34
Leather and Rubber Goods Manufacturing	289	1.6
Food Processing	5,817	31.68
Paper Mills and Printing	1,169	6.5
Ornament and Instrument Manufacturing	31	0.17
Others	72	0.4
Total	19,015	100.00

a. 300-day operation per year assumed.

figures is possible. If the figures listed for the import of lamp oil and fuel oil given in Table 1 on page 6 are added, and if it is assumed that most of these two products went to various domestic uses, the total of 684,692 metric tons is derived -- a figure which substantially agrees with the one which gives transportation and industrial consumption as 135,000 metric tons. It must be recalled, however, that no losses were subtracted from the 684,692-metric-ton total. If this 5-percent loss factor is subtracted, a total of 650,368 metric tons is reached, a figure which closely agrees with the assumption of 175,000 metric tons consumed by transportation and industry. For convenience, and recognizing the possibility of a substantial margin of error, the figure for domestic heating and lighting is rounded off to 650,000 metric tons.

2. Wartime.

a. Japanese Occupation.

In the years immediately prior to the entry of the US into war in the Pacific, the most reliable evidence of the amounts of liquid fuel consumed in the areas of North, Central, and South China under Japanese occupation consists of import statistics from Japanese statistical sources. Just what proportion of those imports were ticketed for Japanese military and governmental consumption, however, is not known.

In 1938 (see Table 1), total POL imports into China reached 500,000 metric tons. This figure allows for the various losses before consumption. In 1939, the last prewar year for which any firm data are available, the amount of POL imported fell below 400,000 metric tons. If the rate of decrease is assumed to have been constant for 1940 and 1941, in the absence of any other data, imports may have fallen as low as 200,000 metric tons.

Although the evidence is not absolutely clear, requirements in China may have fallen to extremely low levels in the next 3 years. According to evidence collected from responsible Japanese officials interrogated after World War II, the forward areas in China received 36,000 metric tons of POL in 1942, 30,000 metric tons in 1943, and 10,000 metric tons in 1944. 30/ POL requirements in Japanese-occupied China and Manchuria are shown in Table 11.

Table 11

Total Requirements for POL in Japanese-Occupied China and Manchuria 1941-44

Metric Tons

Year	China	Manchuria	Total
1941	200,000	126,232	326,232
1942	36,000	139,057	175,057
1943	30,000	50,959	80,959
1944	10,000	71,108	81,108

b. Nationalist China.

In those areas under Chinese Nationalist control during World War II, consumption of POL fell off to practically nothing.

The information on fuel allocation given in Table 12* was collected from official Chinese sources during the war and represents the fuel allocation schedule of the Chinese Nationalist forces. It was in effect at the time of the completion of the Burma Road, when the Nationalists, fighting alongside the Chinese Communists, had taken the offensive against the Japanese. It is significant, however, that very few of the major oil-consuming centers were in Chinese hands at that time. This schedule, it should be noted, includes military needs. It should be especially noticed that when military and governmental organization allotments were subtracted from the total, little was left to be distributed to Chinese civilian consumers. Total civilian consumption in Nationalist China, according to this information, reached only about 6,300 metric tons in 1945. 32/

c. Total.

If the foregoing evidence and estimates are accepted, the civilian and military requirements of Japanese-occupied Manchuria, Japanese-occupied China, and Nationalist China ranged from 136,000 to 400,000 metric tons. 33/

That this range of consumption requirements is within reason may be illustrated by analogy with cutbacks imposed by the Japanese in their home islands. Civilian consumption of petroleum products in Japan was cut back by 78 percent between 1940 and 1944. 34/ If it is assumed that the Japanese cut back civilian consumption by at least this same amount in the areas under their control, then civilian requirements in China and Manchuria would have totaled about 198,000 metric tons. (900,000 X 78 percent equals 702,000, or 198,000 metric tons available to civil consumption.) This figure, it will be noticed, falls within the range of 136,000 to 400,000 metric tons -- a range, incidentally, which includes military requirements of the Japanese and Chinese on the mainland.

By two different methods, then, it has been shown that civilian POL consumption in China and Manchuria during World War II may have been about 200,000 metric tons.

* Table 12 follows on p.23.

S-E-C-R-E-T

Table 12

Allocation of Fuels in Nationalist China
January-May 1954

Type of Consumer	Gasoline		Alcohol		Vegetable Gas		Diesel		Vegetable Diesel	
	Metric Tons	Percent	Metric Tons	Percent	Metric Tons	Percent	Metric Tons	Percent	Metric Tons	Percent
Government Organizations	352	13.42	338	1.48	30	18.25	0.8	1.66	16	1.42
Military Organizations	1,457	52.17	20,215	88.76	105	62.81			826	75.10
Transportation Administration	809	30.75	1,504	6.25	8	4.64	46	98.34	179	16.24
Educational Groups	26	1.00	42	0.18	10	5.83			5	0.41
Industrial and Commercial Institutes (Including Banks)	62	2.37	303	1.27	14	8.47			74	6.77
Private Individuals and Others	34	1.29	13	0.06					0.6	0.05
Total a/	2,738	100.00	23,915	100.00	167	100.00	46.8	100.00	1,100.6	100.00

a/ Total of all products is 27,907 metric tons for this 5-month period. 27,907 X 2 is 55,934 metric tons. Annual production for the same period given as 37,294 X 2 is 74,588. Thus, 18,654 metric tons is unaccounted for. This may have found its way into the black market. It must also be remembered that to these amounts should be added POL coming over the Burma Road. 350 gallons per metric ton is used as the conversion factor. It must be emphasized, however, that the area over which the above quantities of petroleum products were distributed was small when compared to the territorial extent of Communist China today. The Nationalists had been squeezed into Southwest China and isolated back districts.

S-E-C-R-E-T

3. Postwar (Including Manchuria).

In the immediate postwar years in China, the POL demand was quite chaotic. Coal supplies had not begun to flow back to the boilers of Chinese industry, and mass conversions to fuel oil as a substitute fuel were so common that the Chinese Nationalist government was forced to forbid further conversions in the economy in 1948. 35/ Imports of POL ranged from 800,000 metric tons to more than 2 million metric tons in this period, although by 1949, when the Communists seized China, POL imports had fallen off considerably. 25X1

[redacted]

In the postwar as in the prewar period, foreigners continued to consume considerable quantities of POL. According to estimates [redacted] 25X1
25X1 [redacted] American households used fuel oil for heating at the rate of 10 metric tons per household per year. 37/ In 1947 there were approximately 30,000 foreigners in Shanghai. If only 5,000 separate households were maintained by these 30,000 residents, then 50,000 metric tons of fuel oil for domestic heating would have been required. Unfortunately, the evidence for firm estimates of foreign requirements of POL is not available at this time, and, consequently, only qualitative data may be cited. Another China hand who worked for a US oil company in Shanghai reported that electric power was so expensive in the 1946-49 period that people found it expedient to use kerosene for lighting in Shanghai and that the large cafés and nightclubs catering to foreigners as well as the apartment houses in which many of these same foreigners lived converted to fuel oil for heating. 38/ [redacted] 25X1
[redacted] oil was universally used by foreign residents 25X1
of Shanghai and other major Chinese cities because they insisted on comfort and they could afford to pay the prices demanded for the fuel. Total annual requirements of petroleum products for foreign groups in China

* Table 13 follows on p. 25.

Table 13

Areal Pattern of Domestic Consumption
of Petroleum Products in China
1947

Metric Tons a/

Area	Motor Gas	Kerosene	Diesel and Fuel Oil	Lubricating Oils	Area Total b/	Percent of Total
Shanghai	136,840	112,252	864,000	12,000	1,125,092	78
Nanking	23,950	101,017	9,600	24	134,591	9
Hankow	17,107	N.A.	6,000	N.A.	23,107	2
Chungking	10,000 c/	5,000 c/	4,880 c/	120 c/	20,000 d/	1
Tsingtao	17,107	12,000	N.A.	120	29,227	2
Tientsin	23,950	N.A.	6,000	180	30,130	2
Canton	17,107	N.A.	60,000	60	77,167	5
Product Total	246,061	230,269	950,480	12,504	1,439,314	99

a. Conversion factor, all products: 8.3 barrels/metric ton.
b. With the exception of Chungking consumption, the other figures are derived from US Army figures. 39/
c. Arbitrarily allocated.
d. This figure derived from American Consulate report of 1948 POL sales in Chungking. 40/

in the postwar period, therefore, may have ranged between 50,000 and 250,000 metric tons. 41/ The Chinese Communists reduced this category of POL consumption following their victory in 1949 by expelling foreigners from the country, by strict rationing systems, and by social pressures that encouraged all residents in China to avoid identifying themselves with the capitalist class.

a. Transportation.

(1) Railroads.

Prewar consumption of POL by Chinese and Manchurian railroads totaled approximately 13,500 metric tons. In that period the average amount of freight hauled equaled about 99 million metric tons. [redacted], this quantity of haulage was equaled again in 1950. 42/ Assuming a constant consumption ratio, Chinese and Manchurian railroads again consumed 13,500 metric tons in 1950. At the present time, according to many reports, advice by Soviet railway personnel is improving the efficiency of the

25X1
25X1

Chinese railroad system. Room for improvement exists as may be demonstrated by the fact that in the prewar years Chinese railroads consumed three times more oil and grease than did the Manchurian roads under Japanese supervision, although the Manchurian roads hauled twice as much freight. Because of this increasing efficiency, consumption of POL by Chinese railroads is held constant through 1953, although tonnage hauled and kilometers traveled may increase.

(2) Motor Vehicles.

The total number of motor vehicles in the Chinese motor park increased to 57,681 in the postwar period, and the composition of the park changed considerably. The prewar motor park included an overwhelming number of passenger motor cars; the postwar park consisted mostly of motor trucks. According to statistics compiled by the Economic Commission for Asia and the Far East, a subcommittee of the United Nations Economic and Social Council, in 1947, trucks numbered 37,287; motor cars, 16,071; and buses, 4,323. 43/

Imports of gasoline, naphtha, and benzine totaled 266,359 metric tons in 1946. Subtracting the 5-percent loss figure, the total amount of POL available to consumption by motor vehicles and aircraft in China in 1946 would have equaled 253,041 metric tons. If 3 metric tons per vehicle per year is taken as the consumption factor for motor vehicles in the postwar period, then 173,043 metric tons of gasoline were consumed. If 4 metric tons is taken as the factor, then 230,724 metric tons of gasoline were used. The factors ranging between 3 and 4 metric tons are derived from known data in the prewar years and used in this postwar period to establish the range of consumption. At the 3-ton consumption rate, 79,998 metric tons would have been left to aircraft consumption; at the 4-ton rate, 22,317 metric tons would have remained. 44/

Although it should be expected that the motor park would decrease in this period because of normal attrition, lack of parts, poor service, and bad roads, statistics to detail this decrease do not exist. In the absence of any statistics, the number of motor vehicles is believed to have been constant for the years 1946-49, and the consumption rate per vehicle is varied as the known gasoline imports were increased. For instance, in 1947, when gasoline imports soared to a record high of 407,984 metric tons before losses, the combined factors of decreasing efficiency of the aging vehicles and increased usage may have increased the consumption rate per vehicle by as much as 2 additional metric tons. Thus, the Chinese motor fleet may have used between 230,724 and 346,086 metric tons of gasoline in 1947. If 5 metric tons per vehicle is used as

the consumption factor for 1947, 288,405 metric tons were used, and a balance after losses of 99,180 metric tons remained for consumption by civil and military aviation. 45/

In 1948, 238,171 metric tons of gasoline were available to motor vehicle and aircraft consumption. 46/ If, in the face of such a decrease in imports, it is assumed that the consumption factor per vehicle fell back to the 1946 factor of 3 metric tons per vehicle per year, then approximately 173,043 metric tons of gasoline were consumed by the motor park, and 65,128 metric tons remained to be consumed by civil and military aviation.

In 1949 the derived value of POL imports into China suggests that total imports of POL equaled approximately one-half the total imports for 1948. 47/ Thus 700,000 metric tons may be assumed to have entered China during 1949. Using the percentage ratio between imported products for 1948, gasoline imports would have approximated 126,000 metric tons in 1949. That such a severe cutback on available gasoline supplies affected the Chinese economy can be demonstrated qualitatively by the many reports on the mass substitutions of other fuels and fuel-burning devices in the economy. If it is assumed that 70 percent of the gasoline was burned by motor vehicles, then only 88,200 metric tons of gasoline were burned by the Chinese motor park in 1949. The balance of 37,800 metric tons of gasoline may be assumed to have been burned by aircraft or by motor launches.

Lubricating oil requirements for Chinese vehicles, like gasoline requirements, were high in the postwar period. According to statistics released by the United Nations, the ratio between lubricating oil and gasoline consumption by motor vehicles was approximately 10 percent. 48/ Using this as a basis for calculation, Chinese vehicles required 17,304 metric tons in 1946, 28,840 metric tons in 1947, 17,304 metric tons in 1948, and 8,820 metric tons in 1949. The consumption of gasoline and lubricating oil by motor vehicles in China from 1946 to 1949 is summarized in Table 14.*

It should be emphasized, however, that motor vehicle consumption of POL in China in the postwar years represents an extraordinary situation. From 1946 to 1949, supplies of gasoline and lubricating oil, as well as other petroleum products, kept pace with demand for the first time in many years. In addition to this fact, it should be pointed out that in this period Nationalist China was busily engaged in rebuilding its war-torn economy as well as waging a war against the Chinese Communists moving down from Manchuria. Therefore, consumption may be

* Table 14 follows on p. 28.

Table 14

Estimated Consumption of Gasoline and Lubricating Oil in China 1946-49

Metric Tons

Commodity	1946	1947	1948	1949
Gasoline	173,043	288,405	173,043	88,200
Lubricating Oil	17,304	28,840	17,304	8,820
Total	190,347	317,245	190,347	97,020

expected to have exceeded "normal" Chinese requirements.

Following the Communist victory in late 1949, the Chinese Communist military not only took over China's motor vehicles but claimed first call on all supplies of gasoline. Industrial use received second priority; communications, third priority; and government use, fourth priority. According to a Chinese Communist order,

> " ... the MAR (Major Administrative Regions) shall lead various governmental agencies, troops, and public and private enterprises in exercising strict economy in the use of gasoline, shall promote the use of substitutes insofar as possible, and shall encourage the use of man and animal power for short-haul transport ... ." 49/

During the brief period of low supply, before gasoline and other oils began to flow regularly from the USSR, gasoline rationing for motor vehicles in Shanghai was rather extreme. Table 15* lists the gasoline rationing schedule for motor vehicles for mid-1951. 50/

Dependent upon the volume of gasoline and lubricating oil available in 1952, Chinese Communist requirements may range from 120,000 to 200,000 metric tons. The choice between these figures depends upon the evidence concerning the use of motor vehicles, the size of the motor park, the make-up of that park, and the extent of fuel substitution in the economy.

*. Table 15 follows on p. 29.

Table 15

Gasoline Rationing Schedule for Motor Vehicles
in Shanghai
Mid-1951

Type of Vehicle	Gallons per Month Quantity
Private Car, Small	11.5
Private Car, Small	9.0
Private Car, Small	7.0
Business Car, Small	13.0
Private Car, Large	22.0
Private Car, Large	19.0
Private Car, Large	17.5
Business Car, Large	22.0
Motorcycle	2.5
Bicycle with Trailer	7.5

(3) Military and Civil Aviation.

The other major gasoline and lubricating oil consumer in China in the postwar period was military and civil aviation. In the 1946-49 period, the Chinese civilian airlines boasted of approximately 70 first-line twin-engined aircraft. [redacted] these craft averaged flights of 428 miles per day on the basis of a 365-day year. At a cruising speed of 160 miles per hour, they were in the air approximately 3 hours each. At a consumption rate of 92 gallons per hour, they used approximately 17,000 metric tons of gasoline, and, allowing 10 percent for lubricating oil, a total of 18,700 metric tons of gasoline and lubricating oil. 51/ 25X1

Since data on the Chinese Nationalist military air force consumption for this period are unavailable, evidence on its present Formosan requirements is used to derive its consumption requirements for the immediate postwar period. In early 1952 it was reported that the Chinese Nationalist air force on Formosa was using gasoline at the rate of 42,000 barrels per month and lubricating oil at 3,000 barrels per month. It was expected that gasoline requirements would increase to 66,000 barrels monthly toward the end of 1953. Converted to metric tons per year, the consumption of the Chinese Nationalist air force ranged from 60,000 to 85,000 metric tons per year for gasoline and 6,000

to 8,500 metric tons per year for lubricating oil. 52/

Totaling the consumption of civil aviation and the range of air force requirements, the consumption requirements of Chinese Nationalist aviation in the 1946-49 period may have fallen between 85,000 and 112,000 metric tons of gasoline and lubricating oil. Of these totals, gasoline equaled 77,000 to 102,900 metric tons.

Although the Chinese Communists have had to build up an air force from nothing in the 1949-52 period, the present consumption requirements of that air force are estimated by G-2, Department of the Army, to approximate 110,000 metric tons per year. 53/ This estimate, dependent, of course, upon the number of aircraft in the Chinese Communist air force, is within the range of possibility.

(4) Shipping.

One significant result of World War II for China was the accumulation of a motorized merchant marine and inland river fleet. By late 1949, the Chinese Nationalist merchant marine totaled 155 oil-burning vessels whose daily consumption of fuel oil averaged 15 metric tons per vessel. 54/ Assuming a yearly rate of usage of 200 days, the total oil required to operate all the vessels of the fleet in 1949 would have equaled 465,000 metric tons. Since the 155 vessels had a gross registered tonnage of 549,712 tons, the yaarly consumption rate per gross registered ton (GRT) was 0.85 metric ton, and the ratio of oil-burning ships to coal-fired ships was 65 percent. This calculation gives a factor which may be applied to the data on GRT for the individual years between 1946 and 1949.

Approximately 300,000 GRT of the projected 400,000-GRT river fleet planned by the Chinese Nationalists in the postwar period were to have been oil burning. If the consumption factor for merchant shipping is divided by almost half on the basis of smaller size and unit weights for river ships and a resulting smaller consumption rate, then 0.4 metric ton of oil per GRT per year might have been consumed by inland shipping craft. This would equal about 120,000 metric tons. An arbitrarily assigned consumption rate of 0.001 barrel of lubricating oil per GRT per day gives a percentage ratio of lubricating oil to total fuel oil consumption of about 6 percent, a figure that falls within a reasonable range. This lubricating oil consumption factor is applied to the GRT of merchant and inland shipping for each of the years 1946-49 and is included in the grand total of POL required by Chinese Nationalist shipping for that period.

The oil-burning tonnage of the inland river fleet is known to have approximated 95,000 GRT in 1946. Applying the consumption factor

of 0.4 metric ton per GRT per year, the total consumed at optimum operation would have been 38,000 metric tons of fuel and diesel oil. The consumption of the merchant fleet (derived by 339,190 GRT oil-burning ships X 0.85 metric ton) was about 288,000 metric tons. The consumption of the inland river fleet and the merchant fleet may have reached as much as 345,560 metric tons including lubricating oil. Because Chinese Nationalist shipping was notoriously inefficient, it may be assumed that 20 percent of the total GRT was inoperative at any one time, and, therefore, the total consumption of POL would have been 276,448 metric tons. Imports of fuel and diesel oils in 1946 equaled 331,712 metric tons (see Table 2). The figure, 276,448 metric tons, falls well within this total, and this fact suggests that estimates for shipping consumption for 1946 may have a relatively high degree of validity.

In 1947, inland river shipping may have totaled 165,000 GRT of oil-burning vessels, and their consumption may have reached 66,000 metric tons of POL. The merchant marine increased to approximately 445,000 GRT and consumed about 379,000 metric tons of liquid fuel. The total of 445,000 metric tons of POL thus consumed by inland river and merchant shipping in 1947 would have required 26,700 metric tons of lubricating oil, equaling a grand total of 472,000 metric tons of POL. If, however, this figure is adjusted to allow for the 20 percent of the fleet which is inoperative, then about 377,000 metric tons of fuel and lubricating oils would have been used by Chinese Nationalist shipping in 1947. Since imports of liquid fuel totaled more than 1 million metric tons in that year, this figure may be low.

Calculations for POL consumption for the years 1948 and 1949 were made in the same way as those above, and the results are summarized in Table 16.*

In mid-1951 the Chinese Communists had a merchant fleet of about 500,000 GRT, 70 percent of which was oil burning. 55/ Applying the factor used for calculating POL requirements of the Chinese Nationalists in the 1946-49 period, and assuming optimum operation, this fleet would require approximately 300,000 metric tons of POL annually. The inland river fleet would need approximately 120,000 metric tons, if it may be safely assumed that the Chinese Communists took over the majority of the inland river fleet intact from the Nationalists. Such a consumption rate would require about 25,000 metric tons of lubricating oil. Thus about 450,000 metric tons of POL would sustain Communist shipping at the level of operation reached by the Chinese Nationalists in the 1946-49 period. However, intelligence reports suggest that operation has fallen far below that level, although assumptions of percentages must, at the present state of knowledge, be completely arbitrary. Substitutions of coal-burning vessels for oil-burning vessels in inland and coastal waters would

* Table 16 follows on p. 32.

Table 16

Consumption of POL by Chinese Nationalist Shipping
1946-49

Metric Tons

Year	POL		Lubricating Oil	Adjusted Total a/	Total
	Inland River	Merchant Vessels			
1946	38,000	288,000	19,560	276,448	345,560
1947	66,000	379,000	26,700	377,600	472,000 a/
1948	94,000	485,000	35,000	491,200	614,000 a/
1949	120,000	465,000	35,000	496,000	620,000 a/

a. These totals were downgraded by 20 percent to allow for the estimated level of operation of Chinese Nationalist shipping.

also affect the total of POL used by watercraft in Communist China. Strategic interdiction in the event of an outbreak of hostilities could cut POL requirements for Chinese Communist shipping practically to zero. It is believed, however, that the percentage of ships inoperative at any one time is much higher under the Communists than it was under the Nationalists. In fact, it might be as high as 60 percent. If so, Chinese Communist POL requirements after 1950 may have been at an annual rate as low as 180,000 metric tons.

b. Industry.

Consumption of POL by Chinese industries in postwar China may be estimated in two ways: (1) from a multitude of sources from which a fragmentery picture of consumption may be drawn; (2) by extrapolating from the consumption rates of industry in prewar China and allowing for an increase in the number of plants. In the second method, it is assumed that the tremendous increase in absolute numbers of plants was an across-the-board industrial expansion and that prevailing conditions during that expansion (such as war) precluded a widespread conversion to oil-burning equipment. In other words, the second method holds consumption by type of industry constant, while making adjustments for the greater number of industrial establishments.

Scattered consumption statistics by industry, originating from Chinese source materials for the period 1946-49, are summarized in

in Table 17. 56/ Although these data pertain only to Shanghai, they may be taken as roughly equivalent to China-wide requirements by industry because Shanghai was the industrial center of China in the postwar period.

Table 17

Industrial Consumption of POL in Shanghai
1946-49

Metric Tons

Industry	Diesel Oil	Fuel Oil	Kerosene	Total
Private Electric Power Plants	10,000	360,000 a/		370,000
Cement	48,000			48,000
Enameling	9,600			9,600
Paper		48,000		48,000
Miscellaneous			60,320	60,320
			73,643	73,643
Total	67,600	408,000	73,643	549,243 b/

a. This figure fell to zero after 1949.
b. If this total is adjusted by subtracting the 360,000 metric tons of fuel oil burned by the Shanghai Electric Power Company in the period when it could not get coal to fire its boilers, then industrial consumption of POL by the above industries was about 190,000 metric tons per year. Although the data on which this table is based are fragmentary, they represent the only available statistics found on actual quantities of POL used by industry in China and are the result of many hours of careful combing of Chinese-English language publications.

The results obtained by using the second method are close enough to the data uncovered by research to establish the validity of a range of POL consumption requirements. If 2,435 plants consumed approximately 20,000 metric tons per year in China in the period before World War II, and if it is assumed that the postwar sixfold increase in plants kept POL consumption equipment at a constant ratio, then Chinese Communist industry required approximately 120,000 metric tons in 1950. 57/

Thus, according to two different approaches, Chinese industry in postwar China was consuming POL at a rate between 120,000 and 190,000 metric tons per year. That they actually consumed more than this in specific years can be demonstrated, but it should be emphasized that such consumption was only a temporary substitution of oil for coal in industries that normally used coal as their major fuel.

In the absence of any other information, Chinese Communist industrial POL consumption might be tentatively set at between 100,000 and 200,000 metric tons per year dependent upon the productivity of their industry and the availability of oil supplies. It should be pointed out, however, that substantial cutbacks beyond the lower limit of 100,000 metric tons would be possible without doing serious damage to Chinese Communist industrial output.

c. Domestic Heating, Cooking, and Lighting.

Although domestic consumption of POL was set at approximately 650,000 metric tons per year in the prewar period in Nationalist China, it is important to realize that this category of consumption can be cut to practically zero if necessary. In the postwar period, however, supplies to domestic uses were ample, although fluctuating. If the balance between what has been estimated to have been consumed by the different categories in the years 1946-49 and the total amounts of POL imported is derived, the result may arbitrarily, but legitimately, be assigned to domestic heating, cooking, lighting, and miscellaneous consumption.

A tentative POL consumption schedule by consuming groups in China for the postwar years is summarized in Table 18.

Table 18

Consumption of POL by Consuming Groups in China
1946-49

Metric Tons

Consuming Groups	1946	1947	1948	1949
Railroads a/*	13,500	13,500	13,500	13,500
Motor Vehicles b/	190,347	317,245	190,347	97,000
Aviation c/	98,500	98,500	98,500	98,500
Shipping d/	276,448	377,600	491,200	189,000 e/
Industry f/	155,000	155,000	155,000	155,000
		360,000 g/	100,000 h/	
Domestic Heating, Cooking, and Lighting	108,675	601,620	279,885	147,000 i/
Total j/	842,470	1,922,765	1,328,432	700,000

* Footnotes to Table 18 follow on p. 35.

Table 18

Consumption of POL by Consuming Groups in China
1946-49
(Continued)

a. Precise data on year-to-year changes in railroad traffic are not available. Because of this lack, the over-all estimate for prewar and postwar consumption is carried over unchanged for each year in the period.
b. Fluctuations in motor vehicle consumption may be explained by inadequate supplies in 1949 and a switchover to substitute fuels.
c. The range of consumption requirements for civil and military aviation of 77,000 to 102,000 metric tons of gasoline is averaged, and the resulting 98,500 metric tons held constant during this period. It is believed to be high for 1948 and 1949.
d. A request is presently being processed in the field to determine whether international bunkers were included as imports in the Chinese oil economy. In the absence of that information, it is assumed that they were.
e. This figure of 189,000 metric tons is believed to be fairly accurate, because the disruption of the Chinese civil war in 1949 may have cut the number of operating oil-burning ships by as much as 82 percent.
f. Industrial consumption of 155,000 metric tons is the average of the range between 120,000 and 190,000 metric tons.
g. This figure of 360,000 metric tons represents the amount of fuel oil known to have been consumed by the Shanghai Electric Power Company in 1947.
h. This figure of 100,000 metric tons is assumed, in the absence of any other data, to approximate Shanghai Electric Power Company requirements in 1948. The change-over from oil to coal was gradual.
i. In 1948 the percentage of total imports represented by domestic consumption was 21 percent. Applying this ratio to 1949 imports, the figure of 147,000 metric tons of POL for domestic heating and lighting consumption was derived.
j. Imports for consumption: 842,470 for 1946; 1,922,665 for 1947, 1,328,432 for 1948; and 700,000 for 1949. These import figures (Tables 2 and 3) have been reduced by 5 percent to allow for losses in storage and handling. They represent, therefore, the total amount available to consumption.

C. Chinese Communist POL Requirements.

[redacted] 25X1

[redacted] the Communists planned to keep the consumption of aviation gasoline at zero, because, in the beginning, they had no air force or civil airlines. By 1952, however, this consumption category is estimated to have required about 110,000 metric tons per year. 25X1

Motor gasoline was to be cut down to 35 percent of previous consumption and kerosene to 20 percent. While fuel oil was to be cut to 30 percent, diesel oil was to be increased to 125 percent. Since the Chinese statistics used in this report have included fuel oil and diesel oil as one category, these percentage decreases are averaged, and the combined types of products are found to decrease to 77.5 percent. Lubricating oil and grease were to be cut to 75 percent of the pre-Communist demand.

Applying these percentage reductions to the data summarized in Table 18 for the years 1948 and 1949, a range of probable POL requirements for 1950 is derived. Those results are set down in Table 19. The estimates

Table 19

Estimated Chinese Communist Consumption of Petroleum Products
1950, 1952

Metric Tons

Product	1950	1952
Aviation Gasoline	0	110,000
Motor Gasoline	35,000 to 62,000	200,000
Kerosene	35,000 to 84,000	200,000
Fuel and Diesel Oils	217,000 to 483,000	300,000
Lubricating Oil and Grease	15,750 to 33,750	50,000
Total	301,750 to 662,750	860,000 a/

a. Of the total 860,000 metric tons, as much as 500,000 metric tons may have been consumed in Manchuria and North Korea and the balance in North and Central China.

for the amount being consumed in 1952 are based on the knowledge that Communist China is presently receiving significantly large quantities of POL, that in the 2 years following their victory the Chinese Communists have succeeded in reconstructing various segments of their economy, and that requirements for petroleum products for the Korean war are relatively large. The estimates include military requirements, because, after 1949, it is virtually impossible to differentiate between the civilian and the military demand in Communist China.

In the event of an all out war, and the interdiction of petroleum supplies from the USSR, however, Chinese Communist basic requirements of petroleum products for the operation of their economy could fall significantly below 300,000 metric tons per year. With the exception of lubricating oil and grease, the Chinese Communist economy is not absolutely dependent upon supplies of oil products.

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APPENDIX B

METHODOLOGY

The logic in this report moves from the known to the unknown, and estimates of varying degrees of validity had to be employed quite often in reaching the final breakdowns of petroleum product consumption by the different categories of consumers.

At all times the extrapolations in this work have been kept relatively straightforward and simple, and all statistical methods unsophisticated. Detailed explanations of methodology are given in the text or in the footnotes appended as the Annex. Conversions of volume and quantity have all been based upon commonly accepted conversion factors set forth by POL Conversion Factors and Capacity Tables for Planning Purposes, Armed Services Petroleum Board, January 1949.